Pretend play and language development among preschool children: A meta-analysis

by

Soomin Kim

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Major Professor
Dr. Deborah Norris

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Abstract

Language development in early childhood is an important indicator and precursor for children's later development in various areas, such as emotional, social, cognitive, and academic development. Studies have shown that pretend play, as one of the predominant play types during the preschool period, is an important activity to facilitate children's learning experiences and exploration. However, there has been a lack of consistency in findings across studies due to different study designs. It is likely that these varying study characteristics have resulted in the variability of effects in the pretend play-language relationship, which has been also suggested by previous reviews. These factors point to the potential of meta-analysis for organizing the studies into a common paradigm and better understanding the practical significance of play-language relationships.

The current meta-analysis systematically reviewed and analytically investigated 25 existing empirical studies that had examined the associations between pretend play and language development among young children. The overall magnitude of the association between pretend play and language development, .36, showed a moderate association. Furthermore, moderator analyses indicated that several factors, such as the role of adults or children's play types, tended to have considerable impacts on the associations between pretend play and language development. This study has determined the strength of the research foundation that currently supports inclusion of pretend play in preschool classrooms and has charted future research on the pretend play-language associations in the early childhood research field.

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Chapter 1 - Introduction

Introduction

Language development in early childhood is an important indicator and precursor for children's later development in various areas, such as emotional, social, cognitive, and academic development (Blank, 2012; Connor, Kelly-Vance, Ryalls, & Friehe, 2014; Roskos & Christie, 2011; Sukhram & Hsu, 2012; Sutterby & Frost, 20006; Wells, 2009). According to Hoff (1997), preschoolers' oral language skills include the understanding of sounds, phonemes, and syllables (phonological development); words and vocabulary (lexical development); as well as word order and organization in sentences (syntax development). These language skills along with alphabet knowledge and an understanding of various forms of spoken language and printed text form the foundation of preschoolers' emerging literacy skills (Copple & Bredekamp, 2009; Jacob, Charron, & da Silveira, 2015; Kennedy, Dunphy, Dwyer, Hayes, McPhillips, Marsh, O'Connor, & Shiel, 2012; Paciga, Hoffman, & Teale, 2011; Rajapaksha, 2016) and are "developmental precursors to conventional forms of reading and writing" (Whitehurst & Lonigan, 1998, p. 849).

While emergent literacy among preschoolers is separate from actual understanding of how to read (Hoff, 1997), it is an important precursor of children's later success in language including the development of word and phonemes comprehension, spelling, echo reading, letter recognition, and metalanguage capabilities such as playing with or analyzing language (Christie & Roskos, 2009; Dunst, Trivette, Masiello, Roper, & Robyak, 2006; Shanahan & Lonigan, 2010). Children's narrative abilities, another significant language skill that emerges during the preschool period, rely on these oral language skills along with their emerging literacy abilities to sequence events and tell stories (Bridges, Justice, Hogan, & Gray, 2012; Nicolopoulou & Ilgaz, 2013). Bridges and colleagues (2012) acknowledged that the mastery of narrative skills, such as

story grammar and sequences, during preschool years was predictive of later language success, such as reading comprehension.

Play is an important activity to facilitate children's learning experiences and exploration and to improve children's skills in various aspects (Leong & Bodrova, 2012; Lillard, Lerner, Hopkins, Dore, Smith, & Palmquist, 2013; Roskos & Christie, 2011). Studies have explored the associations between play and language development in preschool children, discovering that children's language skills, such as oral language, literacy and interaction skills, prosper when they are interacting with adults or peers in a playful setting (Morrow, 1990; Morrow & Rand, 1991; Neuman & Roskos, 1990; Nicolopoulou & Ilgaz, 2013; Roskos & Christie, 2011; Saracho & Spodek, 2006; Weisberg, Zosh, Hirsh-Pasek, & Golinkoff, 2013; Whitebread & O'Sullivan, 2012). In fact, play-based preschool curricula have been found to help foster young children's appropriate and significant language development (Hyvonen, 2011; Kennedy et al., 2012; Stagnitti, Bailey, Stevenson, Reynolds, & Kidd, 2016; Weisberg et al., 2013).

Emerging during the second year, pretend play is one of the most predominant play types during the preschool period and is considered a strong medium for strengthening language skills for young children (Bergen & Mauer, 2000; Dansky, 1980; Doyle & Connolly, 1989; Kelly, Hammond, Dissanayake, & Ihsen, 2011; Lim, 1998; Vygotsky, 1967). As a critical component of developmentally appropriate practice (Berk & Meyers, 2013; Einarsdottir, 2014; Han, Moore, Vukelich, & Buell, 2010), pretend play provides children with enriched environments to use and develop their language skills, assuring the opportunities to take on different roles and create a world of pretend situations that use fantasy and symbolism (Ashiabi, 2007; Galyer & Evans, 2001; Lillard, 1993; Lillard, Pinkham, & Smith, 2010; Sutterby & Frost, 2006). Pretend play is helpful to enhance children's narrative skills because children engage in high-level language and

social activities during pretend play (Kavanaugh, 2006; Smith, 2007). Children use language in complicated ways and depend on it to develop themes, characters, and storylines with others (Smith, 2007), which can be either simple (e.g., feeding a baby) or complex (e.g., a sequence of feeding, bathing, and playing with the baby).

Despite the significance of play in children's development, recent educational trends force early education settings to give more weight to the academic components of curricula while decreasing the proportion of play in preschool classroom settings (Brown, 2010; Weisberg et al., 2013; Wood, 2014). These increased academic demands in early childhood settings make it harder for preschool teachers to advocate for the value of play (Bodrova, Germeroth, & Leong, 2013). Therefore, there is a need to advocate for play with an integrative review for addressing the importance of pretend play as a critical learning context for children's emerging language and literacy development in preschool classrooms.

Chapter 2 - Literature Review

Introduction

This chapter of literature review aims to provide theoretical frameworks and background information to conduct a meta-analytic review of research literature. The review includes two major parts – review of theoretical and empirical literature. Aligned with the Vygotskian theoretical frameworks on pretend play and language development during early childhood, the review for the empirical literature begins from exploration of language use in pretend play. Next, it flows to the examination of associations between pretend play and language development, including the importance of inter-subjectivity and the role of experienced partners. The review of literature concludes with an investigation of previous analytic reviews on the link between pretend play and language development. Finally, with the review of literature gaining ground, the purpose statement and research questions of the current meta-analysis are addressed.

Review of the Theoretical Literature

Lev Vygotsky's sociocultural theory holds that human mental activities, such as language, form as a result of interactions with others and cultural experiences (Vygotsky, 1978). The sociocultural theory regards social activities, such as children's play and cultural experiences, as "sources of thinking, the importance of mediation in human psychological functioning … and the inseparability of the individual from the social context" (Wink & Putney, 2002, p.152). These interactions result in children gaining knowledge through engaging in social interactions (Anderson, Moffatt, & Shapiro, 2006; Byrnes, 2006).

Vygotsky (1978) believed that elementary mental functions of humans, such as attention or perception, developed into more sophisticated mental processes, such as language or abstraction, within the sociocultural environment. Vygotsky called this "higher mental

functioning," referring to activities of consciousness dependent on socially shared meanings (Vygotsky, 1978). He asserted that the development of higher mental functions, such as language, occurred in situations where people were interacting with each other in a communicative context (Otto, 2002). For Vygotsky, language acquisition was the most important milestone in child development and represented the development of these higher mental functions. Vygotsky (1978) provided descriptions of language functions as: (a) the primary way of communication with others; (b) a tool for thought; (c) a way in which social experience was represented psychologically; and (d) a means to direct children's attention and behavior. Children's ability to make sense of experiences greatly expand when children are able to think with words (Berk, Mann, & Ogan, 2006). Therefore, language works as a tool of mediation for learning, and directs children's attention and behavior (Wink & Putney, 2002).

One important characteristic of higher mental functions is that they are internalized (Vygotsky, 1978). The term *internalization* refers to a process in which social processes performed on the external states are executed on the internal states (Vygotsky, 1978; Wertsch, 1985). Vygotsky (1978) viewed higher mental functioning as a gradual process of internalization, within which the inter-individual forms were transferred into the intra-individual forms of meaning making (Bodrova & Leong, 2015; Robbins, 2003; Wertsch & Stone, 1985). Children are able to internalize the cultural tool of language and use it for their independent activities and thought processes (Andresen, 2005; Vygotsky & Kozulin, 1986).

Another major characteristic of higher mental processes is that they are mediated by psychological tools such as language, concepts, signs, and symbols (Karpov, 2005). Vygotsky (1978) argued that higher forms of mental functions were dependent on symbolic tools. Children are not born with these psychological tools and thus need to acquire and master them. When

children increasingly master the use of the psychological tools, such as language, these tools transform into mediators of children's mental processes. This internalization of mediators from the social to the internal level thus helps young children develop cognitive abilities to represent mental processes (Wertsch, 1985).

Vygotsky (1967) believed that one of the most significant activities in children's development for internalizing the tools of language was pretend play and he viewed pretend play as "the leading source of development in the preschool period" (p. 6). Vygotsky distinguished a child's play from other forms of activities such as exploration (Bodrova et al., 2013). Play was viewed as a dialogue between differently situated individuals who both cooperated and challenged one another (Henricks, 2014). Vygotsky (1978) demonstrated that pretend play had three characteristics: children a) create an imaginary situation, b) take on and act out roles, and c) follow a set of rules determined by those specific roles to accomplish their play successfully. According to Vygotsky, this process was facilitated by inter-subjectivity or the act of constructing a shared world between individuals through the process of negotiation of meanings (Kozulin, 1990; Wink & Putney, 2002). Inter-subjectivity, or shared understanding, is needed to transform information, ideas, and skills from children's social states to internal-thinking states (Berk et al., 2006). During interactions between a child and an adult or experienced peer, "joint activity" or "inter-subjectivity" is a context of shared and mutual understanding by which they jointly engage and participate in shared activities.

According to Vygotsky (1978), pretend play is an interactional activity shaped by children's social experiences with others. It helps children to form and extend their knowledge and skills through the experiences (Ashiabi, 2007; Han et al., 2010; Rakoczy, Tomasello, & Striano, 2005). Vygotsky (1978) argued that these social experiences helped children act beyond

their actual selves. When children take on others' roles during pretend play, they are able to formulate and follow appropriate behavioral rules in pretense based on the social experiences from their families and communities to accomplish their play successfully (Berk et al., 2006). This distance between the actual development level of a child and the potential "just above" developmental level under more skilled partners' support and guidance represents the zone of proximal development (ZPD). Vygotsky viewed pretend play as a practical application of the ZPD, noting that:

> "In play, the child always behaves beyond his average age, above his daily behavior; it is as though he were a head taller than himself.…play contains all developmental tendencies in condensed form and is itself a major source of development" (1978, p.102).

In fact, new developmental accomplishments become apparent in play earlier than in other activities (Bodrova et al., 2013). For example, during pretend play, children use language to mimic or pretend to be adults. This moves them beyond their current level by acting out real-life experiences of adults and speaking higher levels of language (Wink & Putney, 2002). As a result, children's language is incorporated into the child's thought processes (Vygotsky, 1978).

Children advance beyond their ordinary accomplishments of daily behaviors and control over thinking under guidance of more skilled partners (Vygotsky, 1978) which strengthens the associations between learning and development (Vygotsky & Kozulin, 1986). The ZPD is influenced by others who shape the environments, engage children's participation actively, and respond to their behaviors and words (Bodrova et al., 2013). Adults serve as experts and mediators to create the conditions that guide children to higher levels of functioning (Vygotsky, 1978). Adults' input into children's language development is maximized "when adults

concentrate their assistance at just above the level at which children can accomplish independently" (Beizer & Howes, 1992, p. 27).

In conclusion, the Vygotskian theory has illustrated the association between language development and pretend play. As one of the most significant higher mental functions, language development is an internalized and sign-mediated process. Through pretend play, children learn abstract thoughts by creating an imaginary situation, which helps children become able to use symbols as tools for structuring their language (Andresen, 2005; Li, Hestenes, & Wang, 2016). The learning process within the inter-subjectivity between the child and the partner pulls development into higher level through internalization. The child, engaging in the pretend play with the more skilled partners, is able to transform the socially learned information and skills into his internal-thinking states (Veer & Valsiner, 1991; Vygotsky & Kozulin, 1986). Through the more skilled partner's scaffolding within the child's ZPD, the child is able to establish meanings by explicit verbal communication while using language for interaction and even produce a higher level of speech (Vygotsky, 1978). Eventually, children's learning and development is facilitated by internalizing language from interaction in pretend play and relying on it to develop his own thinking process (Vygotsky, 1978).

Review of the Empirical Literature

Pretend play as Facilitator for Language Development

Children use language to make meaning during pretend play, because the realistic and imaginative meanings of events and roles are different (Galeano, 2011; Pellegrini & Galda, 1990). They transform the meanings of real situations into imaginative situations by using verbal explications, such as "I am the mommy and you are the puppy." They also use language to

clarify and negotiate meanings during pretend play, by assigning and taking on 'characters'. For example, children may say "You cannot do that because you are a puppy."

Weisberg and colleagues (2013) agreed that language thrived in children's interactions with adults and peers in a playful context, stimulating children's learning. Empirical studies have found the associations between pretend play and language/literacy skills (Conner et al., 2014; Han et al., 2010). For example, Han et al. (2010) and Conner et al. (2014) both examined the effectiveness of two different play interventions on children's language development. Han and colleagues (2010) tested two vocabulary teaching protocols on at-risk preschool children. The intervention group received Explicit Instructional Vocabulary Protocal (EIVP) with a play session, and the control group received only EIVP. The results showed that children in the intervention group had a steeper growth trajectory on the measurement of their expressive and receptive vocabularies than children in the control group.

Similarly, Conner and colleagues (2014) found that a play intervention was effective in increasing the amount of time spent engaged in pretend play and auditory comprehension, expressive communication, vocabulary comprehension and expression. They concluded that the play intervention helped children improve the complexity of their play skills, which was in turn related to higher levels of cognition and language skills. In addition, Bergen and Mauer (2000) found a significant relationship among the language/literacy skills in symbolic play. Pretend play was positively associated with children's word performance and literacy skills.

Narrative Development in Pretend Play

Children combine the use of language with their real-life experiences they have had or observed to create and enact scenarios. During this experience, they develop narrative skills, in which they play roles of others based on their perceptions of other characters (Morrow, Berkule,

Mendelsohn, Healey, & Cates, 2013; Nwokah & Graves, 2009). For example, in the observation of two brothers in the pretend play time, Nwokah and Graves (2009) found that the children used personal experiences or memorable experiences at school within their pretend play. The authors interpreted the results that pretend play offered children with an opportunity to master the roles, sequences, and scenarios.

Research has shown narrative skill development within children's pretend play (Dansky, 1980; Elias & Berk, 2002; Ilgaz & Aksu-Koç, 2005; Pesco & Gagné, 2017; Williamson & Silvern, 1991). For example, preschoolers engaged in pretend play were found to exhibit more elaborate and cohesive verbal narratives than those who enjoyed other forms of play (Elias & Berk, 2002). Moreover, Williamson and Silvern (1991) found that children who experienced thematic-fantasy play performed better on the story recall, showing more comprehension of the stories. In a meta-analysis of instruction in early childhood settings that focused on scaffolding narrative skills, Pesco and Gagné (2017) analyzed the effects of nonverbal strategies of story enactments and storytelling with props on children's narrative skills. They found that the effects were greater when the nonverbal strategies (e.g., story enactment) were mixed with verbal strategies than when there was only verbal scaffolding, suggesting that the pretend play fostered children's expressive narrative skills by providing them opportunities of telling and enacting stories.

Inter-Subjectivity in Pretend Play and Language Use

Children do not need to communicate the meaning of their transformations much in the solitary play (Pellegrini & Galda, 1990). Pretend play is collaborative and open-ended, and there is inter-subjectivity between or among the players. In this type of play, children need to initiate and sustain their discourse with others by negotiating to determine the stories or representations.

Playing with peers requires children to have clear directions and also the ability to coordinate their ideas and representations with others (Sawyer & DeZutter, 2007). Dockett (1999) suggested that children learned best in a social environment because they could construct meanings within the inter-subjectivity of interaction contexts.

Studies have found evidence for supporting the function of negotiation in pretend play. Kim and Kim (2017) found that a brother dyad co-constructed and negotiated meaning with each other during their pretend play. For example, when the younger brother started developing a story of dinosaurs, the older brother spontaneously took on the role of audience to support developing the story. De Lorimier and colleagues (1995) found children were more involved in negotiations in pretend play than other play. The participating children showed more complex interactions such as interdependence or sharing of goals. Children also showed mutually responsive interaction with partners in pretend play than nonpretend contexts. Additionally, Lee and colleagues (2005) found that children engaged in sociodramatic play tended to have more advanced verbal communication skills, through which they were able to persuade or influence others' behaviors with advanced language use.

Role of Experienced Partners

According to Vygotsky's theory (1978), children learn higher psychological processes through a social environment with adults' guidance within the ZPD. Howes and Matheson (1992) demonstrated that before children could actively take part in the pretend play by themselves, the older partner had a scaffolding role and supported children's play with guidance. Children develop within the ZPD because the interpersonal interaction between children and adults involve questions, examples, prompts, and explanations. In this way, children accomplish things with adults' assistance today, and they will be able to accomplish the same task on their

own later when those ideas have become internalized within the ZPD (Monighan-Nourot, Scales, Van Hoorn, & Almy, 1987; Wink & Putney, 2002)

Older partners, such as the child's caregivers, use pretend talk to provide children with linguistic challenges during the pretend play. Teachers' language support for children include advanced vocabulary modeling, or expansion, of children's speech, which is more often observed in pretend play contexts than other play contexts (Meacham, Vukelich, Han, & Buell, 2016). Adults can encourage children to repeat sounds and words heard from adults through pretend play, in which the ZPD can be implemented to develop children's phonological skills. Adults also can teach children the meaning of words by incorporating words through stories in pretend play, such as asking questions about the play scenario (Kennedy et al., 2012).

Studies have illustrated the important role of adults on children's language development during pretend play episodes. In Meacham and colleagues' study (2016), they examined preschool teachers' language use during their interaction with children in pretend play. They found that children's verbal responses tended to occur more frequently when teachers extended their topic-initiated utterances in play scenarios. Similarly, Kim and Kim (2017) found the evidence to suggest the significant role of the interaction with the more skilled partner. During pretend play, the mother's immediate responses encouraged and supported the child's meaning-making process within the play.

Review of the Previous Analytic Literature

Three recent attempts have systematically reviewed the links between pretend play and language development (Lillard et al., 2013; Roskos, Christie, Widman & Holding, 2010; Roskos & Christie, 2013). These studies examined previous research on the associations between pretend play and language development with an analytic view. Two of the reviews were narrative in

nature (Lillard et al., 2013; Roskos & Christie, 2013) with one study setting the stage for a meta-analytic method (Roskos et al., 2010).

Lillard and colleagues (2013) conducted a descriptive review on the impact of pretend play on different domains of children's development, by examining correlational, longitudinal, and intervention studies. They argued that more controlled intervention studies were needed because it was not clear which aspects of the play interventions contributed to language development. Based on their examination of studies, they showed that pretend play positively influenced narrative skills. The evidence, however, may not be sufficient to claim the significance of pretend play on narrative development. The authors suggested that underlying variables, such as adult involvement, may be confounding variables (Lillard et al., 2013). Also, different aspects of narrative development, such as telling stories, story memory and story comprehension, showed different results. The authors asserted that there was not enough evidence to definitely claim the 'crucial' role of pretend play on language development (Lillard et al., 2013). They stated that "pretend play would be just one of many routes to a positive developmental outcome… pretend play would often go along with a positive developmental outcome, but for extraneous reasons" (p. 27), suggesting further research to examine whether and how pretend play helps language development.

Roskos and Christie (2013) reviewed the evidence of the play-literacy relationship with a 'critical-appraisal' process, which is a process of "carefully and systematically examining research to judge its trustworthiness and its value and relevance to a particular context" (p. 86). In the review, they synthesized the evidence into three domains: (1) play environment and literacy activity; (2) free play with elements of pretending and oral-language skills; and (3) creative drama and story comprehension. Even though each domain showed the effects of play

on literacy skills, the authors asserted that the characteristics and functions of play would need to be explored in greater detail. They suggested that studies of different literacy-enriched play settings with different intensity, frequency, duration, and conditions would help strengthen the findings of this relationship.

Besides the narrative reviews, there has been an attempt to prepare for a meta-analysis in play-literacy research. Roskos and colleagues (2010) conducted a review of play-literacy research on quantitative findings. They organized the literature as a resource of further meta-analytic thinking, putting them into several categories such as sample size, nature of intervention, measures (standardized or non-standardized), and early literacy outcome variables by domains. They also reviewed the effect sizes of the play-literacy link, finding that most studies showed modest to large effect sizes on the association. The authors recognized two major strands of the studies: environment-oriented and instruction-oriented. In environment-oriented studies, the pretend play environment was manipulated to increase access to materials, such as thematic props or theme-related literacy materials, and social resources such as adults or peers. In the instruction-oriented approach, pretend play worked as an instructional strategy to impact early literacy skills (Roskos et al., 2010). The authors discovered that these two major groups of research had been inconsistent in the measurement of outcomes. Environment-oriented studies focused on different literacy outcomes such as an oral language or literacy activity, while instructional design studies focused on story comprehension and narrative skills. With consideration to all the findings from their analytic review, Roskos and colleagues (2010) suggested the potential for a meta-analysis for further understanding the significance of the play-literacy relationship.

In sum, there have been only narrative and systematic reviews on the associations between pretend play and language development among young children. Therefore, the purpose of this present meta-analytic review is to systematically review and analytically investigate the existing empirical studies that have examined the associations between pretend play and language development among preschool children. This meta-analysis focuses on investigating the overall magnitude of the association between pretend play and language, and also investigating the characteristics of different studies based on moderator analyses to help clarify the differential relations between pretend play and language development.

Potential Moderators on Pretend Play-Language Association

Sociolinguistic knowledge concerns how language use varies according to the sociological variables, such as culture, gender or environments (Hoff, 1997). Based on the previous analytic reviews, it can be concluded that different characteristics of studies may influence variabilities in study results and effect sizes. With the use of moderator analysis across studies, it may be possible to look at which aspects of language development and pretend play have the largest or the smallest impacts, and how effect sizes vary depending on the settings of pretend play.

Different characteristics of participants, such as gender, may also work as a moderator in examining the association between pretend play and literacy. Sociocultural perspective assumes that social and cultural factors impact individuals' development. Vygotsky (1978) claimed that learning systems could be similar among children in similar developmental stages, but could not be identical for all children due to the varying social experiences of children. Gender, even from their early years of life, may provide children with varying experiences. For example, the use of

language and the topics in children's pretend play may be different depending on children's gender.

Smith (2007) revealed that despite the fact that benefits of pretend play were equal to girls and boys, findings were inconsistent from study to study. In some studies, girls and boys did not differ in engaging in pretend play. In other studies, girls engaged in more frequent and more sophisticated pretend play than boys. Smith also reported that girls often engaged in domestic theme pretend play while boys engaged in more physical or rough-and-tumble play (e.g. superhero play). Pellegrini and colleagues (1991), in their longitudinal study of the relations among pretend play, linguistics verbs and early literacy, remarked that they did not examine the gender differences, because previous research suggested that gender differences were minimized when teachers engaged in the play context with children. Therefore, the authors suggested that a future study might examine gender differences in classrooms where such control would not be exercised.

Evidence from different studies provides the foundation for moderator analysis for the present meta-analysis. It is assumed that different study characteristics, such as study design, nature of pretend play settings (e.g. environment- or instruction-oriented), settings of social resources (e.g. involvement of adults) and participant gender, may have some potential impacts on the association between pretend play and language development across studies.

Purpose Statement and Research Questions

Even though the associations between pretend play and language development in early childhood have been explored over decades, different methodologies or different settings of play have been used across studies (Han et al., 2010; Lillard et al., 2010; Lillard et al., 2013; Morrow, 1990; Roskos & Christie, 2011; Weisberg et al., 2013; Whitebread & O'Sullivan, 2012). It is

likely that these varying study characteristics have resulted in the variability of effects in the pretend play-language relationship. Therefore, the correlational links between pretend play and language development need systematic examination and overall agreement in the magnitude of the associations.

The purpose of this present meta-analysis is to systematically review and investigate the existing empirical literature that have studied the associations between pretend play and language development in early childhood. It focuses on investigating the overall magnitude of associations between pretend play and language development. Furthermore, this study also investigates characteristics of different studies based on moderator analyses to help clarify the differential relations between pretend play and language development.

Based on the purpose, this meta-analysis is predicted on the following two research questions:

Research Question 1: What is the overall magnitude (effect size) of associations between children's pretend play and language development?

Research Question 2: What are the study characteristics and how do these characteristics impact the association between pretend play and language development based on the moderator analyses?

Chapter 3 - Methodology

Meta-Analysis

According to Card and colleagues (2011), a meta-analysis is a statistical methodology of "systematically coding existing quantitative (vs. qualitative), multiple participants (vs. single participant) empirical research to extract effect sizes that represent the direction and magnitude of associations" (p. 510). The goal of a meta-analysis is to describe the average effect size of associations in the area. A meta-analysis is different from a primary data analysis in that a meta-analysis (a) collects data from an individual study rather than an individual person, (b) has the study sample and characteristics as independent variables, and (c) has the effect sizes as dependent variables (Card, 2012). The effect sizes from empirical studies are transformed into a common metric, such as correlation coefficients *r*, and are combined or compared across studies. As cited in Card et al. (2011), it has been shown that meta-analytic reviews of literature have greater statistical power than qualitative reviews.

Card (2010) illustrated three factors that suggest the rationale for a meta-analytic review. First, the previously conducted studies have enough similarities to allow for a systematic review and reconciliation of differences. Second, it is beneficial to critically examine the effect size for determining the worthiness of further investigation in the academic world. Third, a meta-analytic review can help identify the inconsistencies in the previous research. This can help describe what has and has not been explored, which is valuable in the growth of an area of investigation.

According to the literature reviews on play-language relationships among young children, previous studies have similarities finding modest to large effect sizes on a selected set of dependent variables. However, research has also shown a lack of consistency in various aspects, such as methodologies of studies or environments of pretend play. These factors align with

Card's (2010) illustrations on the rationale, pointing to a potential of a meta-analysis for organizing the studies into a common paradigm and better understanding the practical significance of pretend play-language relationships.

Literature Search

The search of literature to be included in the present meta-analysis study occurred through the following stages. First, I searched the computerized databases: ERIC, PsycINFO, ProQuest Dissertations and Theses Global, Sociological Abstract, and Social Services Abstract. When searching the electronic databases, the following Boolean phrase was used: ("pretend play" OR "dramatic play" OR "fantasy play" OR "imaginative play" OR "symbolic play" OR "make-believe play") AND ("preschool*" OR "child*") AND ("language" OR "literacy" OR "narrative" OR "story*" OR "read*" OR "write*" OR "letter*" OR "phonology*" OR "lexical" OR "syntax*" OR "morphology*" OR "communicate" OR "pragmatic" OR "vocabulary" OR "spelling"). Second, a hand search of journals and conference proceedings was conducted. The journals were *Early Childhood Research Quarterly*, *Early Education and Development, Journal of Applied Behavioral Analysis*, *American Journal of Play, International Journal of Play*, and *Journal of Speech, Language, and Hearing Research.* The conference proceedings of the American Educational Research Association were searched through the Online Repository. Finally, an ancestral search was conducted by screening the reference lists of studies screened through the previous search strategies.

Inclusion Criteria

A set of inclusion criteria was used to focus the analysis on studies relevant to understanding the association between pretend play and language development. First, all participants must have been between the ages of three and five. Second, no participants had a

known history of neurological or psychopathological problems, including learning and language impairments. Third, the study had been published between 1980 and 2017. This criteria was based on the previous review by Roskos et al. (2010), which suggested that two big strands of play-literacy studies (environmental manipulation vs instructional design) had originated around the early 1980s. Fourth, the study must have quantitatively measured play-language relationships and had components of language abilities as dependent variables. Fifth, the study must have measured play-language relationships in early childhood educational settings (e.g. preschool classroom, child care, nursery school, Head Start). Sixth, the study must have been published in English. Finally, the study must have included sufficient statistics for calculating at least one bivariate effect size.

Included Studies

Appendix A summarizes the strategies of searching and including the studies in a flowchart. There were 5,954 studies found through the computerized databases, which yielded 2,751 studies after removing the duplicates. The initial screening of titles and abstracts of the studies resulted in exclusion of 2,575 studies, yielding 176 studies to be screened through reading the full articles. After screening the full articles based on the first five inclusion criteria, there were 32 studies included. With the hand search of available sources and the ancestral search for these 32 studies, 78 studies were screened for sufficient statistics to calculate an effect size. Finally, a total of 25 independent studies consisting of 1,094 children were included in this meta-analysis, 16 journal articles, 6 dissertations or theses, 2 book chapters and 1 conference paper.

Coding Procedures

Study Coding

The 25 studies included were coded using the following variables. Participant characteristics for the review included the mean age, gender and ethnicity of the children. Early childhood educational setting characteristics were coded according to where the participating children were recruited from (e.g., child care centers, nursery schools preschools, Head Start). The outcome variables were coded as aspects of language (e.g., phonology, narrative, writing, vocabulary).

Other Study Characteristics

Other study characteristics were also coded for the potential moderator analyses. These study characteristics included (a) sample size, (b) publication year of the study, (c) publication status (e.g. published, unpublished), (d) role of adults (e.g. active, passive), (e) settings of pretend play (e.g. environment-oriented, instruction-oriented), (f) play type of children (e.g. solitary, dyadic, collaborative), (g) design of study (e.g. treatment/control group experimental design, pretest/posttest design), (h) settings of the experimental classrooms (e.g. natural, laboratory). For (h) settings of the experimental classrooms, I coded natural versus laboratory according to the settings where children were placed for their play time. If children were taken out of their regular classroom to a separate playroom, “laboratory” was coded for this variable considering it as an “artificial” laboratory setting for children. When children remained in their regular classroom, “natural” was coded into the variable. This coding variable was different from (e) settings of pretend play (e.g. environment vs instruction) because the environmental or instructional manipulation of pretend play could be applied in both natural and laboratory classroom settings. For example, Mercado (2000) used a separate classroom for research where

thematic props, such as miniature animals, were provided. For this study, I coded "laboratory" for the settings of the experimental classrooms, and "environment" for the settings of pretend play.

Effect Size Coding

While coding effect sizes in a meta-analysis, it is rare that each individual study has only one effect size. Even though each independent study is the unit of analysis, normally each individual study derives multiple effect sizes with several factors, such as multiple measures, subgroup analysis, or reporting the effects by groups (Card, 2012). Card (2012) suggested that the researchers need to consider their inclusion criteria and that all the effect sizes that meet the criteria should be coded. Studies reporting multiple effect sizes were coded with the corresponding outcome variables, study characteristics, and effect sizes in each row of the coding sheet. For example, Christie and Enz (1992) examined the effects of play interventions on three different literacy assessments (e.g. concepts about print, emergent writing, letter recognition), and reported the effects for each literacy component. Therefore, coding for this study (Christie & Enz, 1992) included three different rows for the three different components (e.g. concepts about print, emergent writing, letter recognition) and the corresponding effect sizes while other study characteristics remained the same (e.g. sample size, publication status, settings of the classroom).

Evaluation of Coding

For evaluating the reliability of coding, two strategies were used. First, for study characteristics, inter-coder reliability was evaluated. According to Card (2012), the most common index for the inter-coder reliability is the agreement rate, "the proportion of studies on which two coders assign the same categorical code" (p. 75). The agreement value from 75% to

90% demonstrates an acceptable level of agreement (Graham, Milanowski, & Miller, 2012; Hartmann, 1977; Stemler, 2004).

Two independent coders coded the study characteristics included in the current meta-analysis according to the same coding procedure. The included studies were coded by the author, and an independent coder coded a randomly selected subset of 50% of the articles. During the process, the coders met regularly and discussed discrepancies in variable coding. The disagreements were then resolved by providing further specification of the coding scheme. Finally, the agreement rate between the two independent coders was calculated by each study characteristic, with an average agreement rate of 97% (range = 90% to 100%).

For effect size, the coding reliability was evaluated via consistency within the same coder (author). Intra-coder reliability is evaluated by the same person coding a subset of studies twice (Card, 2012). According to Card (2012), the intra-coder reliability may be used when there is not a second coder with sufficient expertise or time to code a subset of studies. Even though there was a second coder coding the study characteristics, it was realistically difficult to train the second coder to be confident or skilled with calculating the effect sizes from different statistics within the time constraints.

Intra-coder reliability may not perfectly substitute the inter-rater agreement due to the single coder's biases or consistency in making coding errors. However, Card (2012) stated that the risk can be reduced by ensuring the independence of the coding session, such as not being aware of which studies will be recoded, working with unmarked copies of the studies, or separating the coding sessions by as much time as practical. Based on Card's (2012) suggestions, a subset of 50% of the studies was randomly selected for recoding, and the 50% studies were

recoded with new copies of studies and a new coding sheet four weeks after the first coding. The intra-coder agreement rate for effect sizes was 94%.

Statistical Methods

Effect Size Calculations

Effect sizes for the current meta-analysis were represented as Pearson correlations (*r*) to show correlations between pretend play and language development. Four of the included studies directly reported the correlations *r*, and other studies reported the results using other metrics. For results reported using other metrics, such as Cohen's *d*, *t* test, *F* test, or descriptive data, such as means and standard deviations, the effect sizes were transformed to *r* using standard procedures (e.g., Rosenthal, 1991), and the "Practical Meta-Analysis Effect Size Calculator" (Lipsey & Wilson, 2001) was used for this procedure.

According to Card (2012), in a meta-analysis, *r* needs to be transformed to Z_r (standardized values) to provide an approximately normally distributed metric. The symmetry of distribution of Z_r is desirable for conducting the effect size analyses across studies (Card, 2012). Therefore, the correlation coefficient *r* was transformed via Fisher's *r* to *z* transformation to obtain Fisher's Z_r for performing analyses. Due to the characteristics of Z_r (e.g. less readily interpretable because it can have values greater than ±1.0, unfamiliar to readers), the results were transformed back into *r* for reporting and ease of interpretation (Card, 2012).

Plan of Analysis

The analyses in the current meta-analysis were conducted using R programming software (Version 3.4.4).

Shifting Unit of Analysis

Cooper (1998) introduced the "shifting unit of analysis" method to deal with multiple effect sizes within the same study in conducting a meta-analysis. For analyzing the overall average effect size, multiple effect sizes from the same study were averaged to yield one effect size for each study with which to conduct the analyses, thus avoiding dependency issues (Card, 2012).

In the analyses of other study characteristics, the corresponding effect sizes were kept separate. Every analysis shifted the unit of analysis in how the data was aggregated. For example, for evaluating whether the effect size differed by specific aspects of language components, the multiple effect sizes were not combined and averaged. Rather, each effect size from one study was left as they were reported and coded separately by aspects of language, as if they were effect sizes from different studies. According to Cooper (1998), even though this approach seems to violate the assumptions of independence, it is a conservative way because we are putting each effect size into the corresponding group.

Homogeneity vs Heterogeneity

In a meta-analysis, the variance across studies is called "heterogeneity", evaluating how much the effect sizes are similar or different from one another (Card, 2012). A heterogeneity analysis, represented by Q statistics, is a significance test to evaluate homogeneity and heterogeneity across studies, with a null hypothesis of all effect sizes come from the same population (Card, 2012). The two sources of variability in the effect size, sampling error and other between-study variability, are represented through the heterogeneity analysis. The analyses in a meta-analysis defer (e.g. fixed-effects model vs random-effects model) according to the Q statistics, which is illustrated in the following section. A heterogeneity/homogeneity analysis was

conducted first to find out whether the effect sizes were estimates of the same population effect size.

Fixed-Effects vs Random-Effects Model

According to Card (2012), when the Q statistics show non-significance, it is assumed that there is one population average effect size, and a fixed-effects model is used. In contrast, when the null hypothesis of heterogeneity test is rejected, it is assumed that we would compute a different type of average that makes different assumptions by a random-effects model. The heterogeneity analysis conducted showed significance in Q statistics, which is discussed in Chapter 4 and guided the selection of the random-effects model to aggregate the mean effect size in the current meta-analysis.

Moderator Analyses

The differences in a meta-analysis are considered as "moderators" because the effect sizes (dependent variable) are the associations between two variables (Card, 2012). These associations between two variables may differ according to some third variables referred to as moderators. Having found that there were differences of effect sizes among the included studies, which is discussed in Chapter 4, it provided justifications to perform moderator analyses. Meta regression was used to test the potential moderator effects accounting for the heterogeneity on the associations between pretend play and language skills. For the moderator analyses, the following coded study characteristics were used: (a) Age, (b) Gender, (c) Settings of play (environment-oriented, instruction-oriented), (d) Pretend play types (solitary, dyadic, collaborative), (e) Methods of assessing language and pretend play, (f) Role of adults (passive, active), (g) Experimental design (e.g., treatment/control, pretest/posttest), (h) Experimental classroom settings (natural, laboratory), and (i) Publication status (published, unpublished).

Meta-regression

A meta-regression is similar to a simple regression, with an outcome variable predicted by one or more explanatory variables (Fu et al., 2011; Deeks, Higgins, & Altman, 2011). In a meta-regression in meta-analyses, the outcome variable is the effect size estimate, and the explanatory variables are the study characteristics. In meta-regressions, studies with larger sample sizes have more influence on the effect size than studies with smaller sample sizes because studies are weighted by the precision of their effect size estimates (Deeks et al., 2011). The regression coefficient (*b)* obtained from a meta-regression describes how the effect size (outcome variable) changes with a unit change in the study characteristics. The *p* value of a meta-regression indicates that whether the relationship between study characteristics and effect sizes is significant or not (Deeks et al., 2011).

Chapter 4 - Results

In this Chapter, findings from the current meta-analysis have been reported in the following ways. First, study characteristics of the included 25 studies in this meta-analysis are described. Second, the associations between pretend play and language skills, including both overall and specific aspects of language skills are reported with: (a) the average correlation (effect size), (b) 95% confidence intervals of this mean effect size, which can be interpreted as the plausible range of actual effect sizes, (c) the heterogeneity of effect sizes across studies (Q statistics), and (d) results from moderator analyses that investigate whether coded study characteristics predict these variations across studies. Finally, the evaluation of publication bias in this meta-analysis is reported.

Descriptions of Studies Included

Characteristics of the 25 studies included in this meta-analysis are summarized in Table1. Sixteen studies were published in peer-reviewed literature, 6 theses or dissertations, 2 book chapters, and 1 conference paper. A majority (23) of the samples were recruited from preschool, kindergarten, child care, and nursery school. In one study participants were recruited in Head Start, and one study recruited participants through local birth records. The sample sizes generally ranged from 10 to 96 children, with an outlier of 208 children and a median sample size of 30. The mean age of participants ranged from 42 to 65.08 months, with a median age of 55.2 months. Ethnicity, this study characteristic was reported too infrequently to code (not reported in 58% of studies).

Associations of Pretend Play and Language

Associations with Overall Language Skills

The random-effects model of the association between pretend play and overall language skills included 25 effect sizes for computing the overall effect size, using each study as the unit of analysis (Table 2). The result showed that τ^2 (estimated amount of total heterogeneity) was 0.0537 and I^2 (total heterogeneity) was 78.10%. I^2 is "the proportion of total variation in the estimates of treatment effects that is due to heterogeneity" (Shadish & Haddock, 2009, p. 263). A small, medium, and large heterogeneity is respectively 25%, 50%, and 75% (Shadish & Haddock, 2009). Therefore, the results of I^2=78.10% showed that 78.10% of variation reflected actual differences in the population mean. The 95% confidence interval for τ^2 was (0.023, 0.131) and (60.44, 89.69) for I^2. The heterogeneity test showed that $Q_{(24)} = 108.45$, $p<.0001$, indicating there was significant heterogeneity across the studies and the studies did not share a common effect size.

The model results provided the estimated model coefficient with standard error and confidence intervals. The mean effect size (Fisher's Z_r) was 0.38 with standard error 0.057. The corresponding test statistics z value was 6.68 ($p<.0001$). Then, the Fisher's Z_r was transformed back to the Pearson's *r* for reporting, with mean effect size of 0.36 (95% CI: 0.26, 0.46). According to Cohen's (1992) criteria for evaluating the magnitude of correlation coefficient, small, medium, and large effect sizes are respectively .10, .30, and .50. The overall mean effect size r=0.36 indicated that there was a moderate relationship between pretend play and language.

For representing the results, a forest plot (Figure 1) was utilized. A forest plot is a graph that visually shows the results from the individual studies (effect size and confidence interval), as well as the estimate of overall effect size and associated confidence interval (Israel & Richter,

2011). According to Borenstein and colleagues (2009), the confidence intervals on a forest plot represent the precision of studies, with a narrower interval reflecting better precision. The studies with more weight (larger sample size) are assigned more ink in the plot, representing the relative impact of the different studies.

The heterogeneity test provided evidence of variabilities across studies, but it did not provide information on which studies may be influencing to overall heterogeneity. Thus, a Baujat plot (Figure 2) was constructed to illustrate studies that contribute to overall heterogeneity and overall result. A Baujat plot represents the contribution of each study to the overall heterogeneity on the horizontal axis, and represents the influence of each study on overall results (Baujat, Mahé, Pignon, & Hill, 2002). Through the Baujat plot, it was able to identify the potential studies which may influence the meta-analysis. The study identified was Study 18 (Pellegrini, 1985).

Next, a diagnostic test was also conducted to identify potential outliers and influential cases to find out the potential influential studies, which might have large residuals, and removal of those identified cases would reduce the amount of heterogeneity (Viechtbauer & Cheung, 2010). The Influence Diagnostic Test shows outlyingness, leverage, and influence of results with various influence statistics, such as standardized residuals, DFFITS values (measuring the influence of an observation on its own fitted value), Cook's distances (measuring the influence of an observation on all predicated values), covariance ratios, and leave-one-out estimates of the amount of heterogeneity (Viechtbauer & Cheung, 2010). The result of influence test and plot (Figure 3) also showed that Study 18 (Pellegrini, 1985) was identified as a potential outlier and an influential case.

With diagnosing the influential outlier, I conducted the analyses again excluding Study 18. The random-effects model included 24 effect sizes, showing $\tau^2 = 0.0342$ (95% C.I. 0.012, 0.095), $I^2 = 69.55\%$, and $Q_{(23)} = 76.89$, $p<.0001$. The model results showed that the Fisher's Z_r was 0.35 with standard error of 0.05 ($z = 6.92$, $p < .0001$). The back-transformed mean *r* was 0.33 (95% C.I.: 0.24, 0.42), still representing a moderate effect size. The forest plot for this analysis is shown in Figure 4, and the Baujat plot and influence test for this analysis did not show any potential influential study.

Analyses of Study Characteristics

To test the link between certain study characteristics and the resulting effect sizes, meta-regressions were performed using R. First, a meta-regression was conducted to test the potential link between publication year and the effect size, to see if the magnitude of effect sizes had shifted over time. The results showed a non-significant coefficient linking the publication date and overall effect sizes (b= -.009, p= .069). This result indicated that publication date was not significantly linked to the magnitude of each study's overall effect size, but it showed a trend towards significance. Next, a meta-regression was conducted to test the link between overall effect sizes and children's mean age. The results showed that there was non-significant but a trend towards significant link (b= .017, p= .08), indicating there might be a positive link between children's age and the effect sizes. Next, a meta-regression result of gender on the associations between pretend play and language abilities showed that children's gender did not impact the link (b= -.813, p= .559).

Next, moderator analyses were conducted to examine whether the link between pretend play and language differed according to the categorical study characteristics. Analyses revealed (Table 3) no significant differences for the relationship between pretend play and language

development based on study characteristics, but there were two study characteristics (e.g., play type, role of adults) that showed marginal significance. First, the analysis of play type of children (e.g., solitary, dyadic, collaborative) showed that the overall association between pretend play and language was stronger ($Qb_{(2)} = 5.16$, p=.076) in dyadic play (r=.54) compared to solitary play (r=.17) and collaborative play (r=.35). Second, the analysis of role of adults showed that the overall association between pretend play and language was stronger ($Qb_{(1)} = 3.00$, p=.083) when adults maintained passive (r=.45) than active (r=.28) roles.

Associations with Specific Aspects of Language Development

For analyzing the associations between pretend play and specific aspects of language development, I divided three subgroups according to the specific aspects of language development. Originally, language development included several specific aspects, such as syllable, narrative, writing, storytelling, print awareness, and letter recognition. If each of these aspects was used as a subgroup, there might have been more than ten subgroups for analyses, resulting in not enough studies included within each meta-analysis. This would not fit for analyses according to Deeks and colleagues' criteria (2011) for a meta-regression, suggesting that a meta-regression should generally not be considered when there are fewer than ten studies in a meta-analysis.

Therefore, components of language development were grouped into one of three subgroups of language development: expressive language, language development related to structure, and print awareness. The expressive language category included narrative, storytelling, language production and vocabulary. The language structure category was related to the ability of understanding the structure of language, such as sound structure (e.g. phonological skills) and grammatical structure (e.g. syntax). Finally, the print awareness category included the

components related to alphabetical knowledge, such as print awareness, emergent writing and letter recognition.

Associations with Expressive Language

For the analyses of the association between pretend play and specific aspects of language development, each subgroup of language components (e.g., expressive language, language structure, print awareness) was used as the unit of analysis. First, using the subgroup of expressive language skills as the unit of analysis, the random-effects model of the association between pretend play and the expressive language skills included 43 effect. The result showed that τ^2 was 0.2736 and I^2 was 91.72%. The 95% confidence interval for τ^2 was (0.17, 0.42) and (87.06, 94.43) for I^2. The heterogeneity test showed that $Q_{(42)} = 840.25$, $p < .0001$. The model results provided the estimated model coefficient with standard error and confidence intervals. The mean Fisher's Z_r was 0.25 (SE=0.08, z=2.89, p=0.0038), and back-transformed r=0.24 (95% C.I. 0.08, 0.39).

Next, meta-regressions were conducted to test the link between certain study characteristics and the resulting effect sizes of association between pretend play and expressive language skills. The result of a meta-regression on the potential link between publication year and the effect size showed a non-significant coefficient linking the publication date with expressive language (b= -.004, p= .61). This indicates that publication date was not significantly linked to the magnitude of effect size of association between pretend play and expressive language. Next, a meta-regression was conducted to test the link between effect sizes and children's mean age, which showed that there was no significant link (b= .014, p= .42). A meta-regression of gender on the effect sizes also showed a non-significant result (b= -1.48, p= .427).

Moderator analyses were conducted to examine whether the link between pretend play and expressive language skills differed according to the categorical study characteristics. Analyses revealed (Table 4) no significant differences for the relationship between pretend play and expressive language skills based on study characteristics.

Associations with Language Structure

Next, the subgroup of language structure was used as the unit of analysis. The random-effects model of the association between pretend play and the language structure included 12 effect sizes for computing the average effect size. The result showed that τ^2 was 0.1069 and I^2 was 62.75%. The confidence interval test revealed the 95% confidence interval for τ^2 was (0.02, 0.43) and (21.61, 87.07) for I^2. The heterogeneity test showed that $Q_{(11)} = 29.26$, p=0.0021. The model results provided the estimated model coefficient with standard error and confidence intervals. The mean Fisher's Z_r was 0.59 (SE=0.12, z=4.77, p<.001) and the back transformed r=0.53 (95% C.I. 0.34, 0.69), suggesting a large association between pretend play and language structure development (Cohen, 1992).

To test the influence of study characteristics, first, a meta-regression was conducted to test the potential link between publication year and the effect size showed a significant coefficient linking the publication date with effect sizes between pretend play and language structure development (b= -.027, p=0.003). This indicated that publication date was significantly and negatively linked to the magnitude of the association between pretend play and language structure development, suggesting that the reported effect sizes tended to be smaller with time. A meta-regression to test the influence of children's mean age revealed significance (b= .057, p= .031), indicating that the association (effect size) between pretend play and language structure development was larger in older children than younger ones. Next, the result of a meta-

regression of gender and effect sizes showed non-significant results (b=-1.243, p= .545), indicating that gender did not moderate the link between children's pretend play and language structure development.

Categorical moderator analyses were then conducted to examine whether the link between pretend play and expressive language skills differed according to the categorical study characteristics. Analyses revealed (Table 5) some significant differences for the relationship between pretend play and language structure development based on study characteristics. First, the result of moderator analysis of children's play type showed that the association between pretend play and language structure development was stronger ($Qb_{(1)}$ = 22.36, p<.001) in dyadic play (r=.78) compared to collaborative play (r=.33). The result of analysis of publication status revealed that the association was stronger ($Qb_{(1)}$ = 7.07, p=.008) in published studies (r=.66) than in unpublished works (r=.18). In addition to these significant findings, other moderator analyses (e.g. study design, role of adults, play settings) showed the findings of trends towards significance (p<.10).

Associations with Print Awareness

Next, the subgroup of print awareness (e.g., print awareness, letter recognition, writing skills) was used as the unit of analysis. The random-effects model of the association between pretend play and the subgroup of print awareness included 17 effect sizes for computing the average effect size. The result showed that τ^2 was 0.1839 and I^2 was 81.69%. The 95% confidence interval for τ^2 was (0.08, 0.43) and (64.63, 91.34) for I^2. The heterogeneity test showed that $Q_{(16)}$ =116.64, p<.0001. The model results provided the estimated model coefficient with standard error and confidence intervals. The mean Fisher's Z_r was 0.55 (SE=0.12, z=4.61, p<.001), and the back transformed r=0.50 (95% C.I. 0.31, 0.66).

The first meta-regression to test the potential link between publication year and the association (effect size) between pretend play and print awareness revealed that publication date was not significantly related to the association (b= .008, p= .545). The second meta-regression to test the influence of children's mean age on the association between pretend play and print awareness showed a non-significant link (b= .027, p= .097). Next, a meta-regression was conducted to examine the influence of gender on the effect size of associations, which showed the results of b= -6.60 and p= .011. Since the gender variable was coded as a continuous variable of the proportion of male participants, this significant result indicated that the effect size was stronger among girls than boys.

Categorical moderator analyses on the associations between pretend play and print awareness revealed (Table 6) no significant differences for the relationship based on study characteristics, but there was one study characteristic (e.g., classroom settings) that showed a trend towards significance. The result of moderator analysis of classroom settings showed that the association between pretend play and print awareness tended to be stronger ($Qb_{(1)}$ = 3.09, p=.079) in natural settings (r=.64) compared to laboratory settings (r=.31).

Publication Bias

In meta-analyses, two broad types of biases contribute to under-representation of non-significant findings (Card, 2012). The first type is that researchers are less likely to report non-significant results. The second type is the selective publication bias, which refers to the tendency to publish only the significant results rather than non-significant results. Therefore, several ways were utilized to evaluate the potential presence of publication bias.

Differences by Publication Status

First, I evaluated whether the obtained results differed by publication status. As one of the between study characteristics, publication status was coded for each study in the coding procedure, and dichotomized and dummy coded (0=unpublished, 1=published). The publication status variable was used as a predictor of all effect sizes included in the meta-analysis, comparing the differences of effect sizes between unpublished and published studies. The result showed that in none of the cases the publication status appeared as a significant predictor (p=.52), suggesting there were no detectable differences in the studies due to publication bias.

Funnel Plot

Funnel plots are scatter diagrams where effect size and sample size are variables. With plotting out sample size and effect size, it is expected to see a huge range in the effect size when studies have small sample sizes, whereas studies with larger sample sizes will show less range of effect sizes (Card, 2012). With the threat of non-significant results not being reported, it is expected to see a substantial negative correlation in the funnel plot missing non-significant findings. This is because studies with small sample sizes tend to only report the results when they have significant effect sizes, while studies with larger sample sizes are able to find small effect sizes that are significant. Therefore, the asymmetrical distribution of the funnel plot (Figure 5) was evaluated to make a judgement whether there was an expected funnel type shaped, symmetrical triangle (r=.0.36 as estimated in the previous random-effects model analysis). It was challenging to make decision about the shape, especially because the sample size was not large.

Trim and Fill Funnel Plot

The trim and fill method is used for adjusting for publication. It assesses for publication bias by using a funnel plot to evaluate the asymmetrical distribution of the included studies, assuming that there are potential missing studies on one side of the funnel plot bias (Duval & Tweedie, 2000). The "inclusion" of these missing studies may provide a corrected mean effect. This trim and fill method calculates how many studies would need to be trimmed off the funnel for a symmetric distribution (Sutton, 2009). Using random-effects, the trim and fill plot (Figure 6) results plotted 3 potential studies missing on the right side of the funnel plot for overall associations between pretend play and language development. The three imputed studies were shown as a blank circle, and the point estimate for this trim and fill data (k=28) was 0.42 (95% C.I. 0.31, 0.53). The impact of the 3 potential missing studies was fairly small, suggesting the overall mean effect size were reasonably robust against publication bias (Borenstein et al., 2009).

Statistical Tests on Publication Bias

Since the interpretation of funnel plots can be subjective, there are statistical tests, taking the same logic of the funnel plot, to quantify the information rather than make subjective determination based on the figure (Card, 2012). Since a good funnel shape is symmetric, it is assumed that the midpoint of the effect size of the small samples is the typical status of the effect size of the large samples. If a regression analysis is conducted out of the correlation between sample size and effect size, it will look like that r=.0, suggesting that small studies and large studies are finding the same effect size on average.

The association between the effect size and sample size was evaluated using both the adjusted rank correlation approach and Egger's linear regression approach (Begg & Mazumdar, 1994; Egger, Smith, Schneider, & Minder, 1997; Viechtbauer, 2010). The rank correlation test

considers an adjusted rank correlation between study effect sizes and standard errors. A significant correlation in this test indicates funnel plot asymmetry, which may suggest publication bias (Card, 2012). The second statistical test, Egger's linear regression, regresses the standard normal deviate of the effect size of each study from zero onto the precision. Neither Egger's regression test (p=0.87) or the Rank correlation test (p=0.89) was statistically significant, suggesting that there was no evidence of publication bias according to these tests.

Chapter 5 - Discussion

This meta-analysis examined the overall magnitude (effect size) of the association between pretend play and language skills among young children. Results of this study suggest that there is overall a moderate link between pretend play and language development (r=.36, p<.0001), and heterogeneity across studies. Based on further analyses of three specific aspects of language development (e.g. expressive language, language structure, print awareness) and moderators, there are several considerable findings need to be further addressed in the following discussion section.

Differences of Effect Sizes

Differences in Demographic Factors

The results of analyses of children's mean age on the association between pretend play and language development showed either significant or trends towards significant results in overall language (b= .017, p= .08), language structure (b= .057, p= .031) and print awareness (b= .027, p= .097). Since the dependent variable in this meta-analysis is the association (effect size) between pretend play and language development, these results indicate that as children grow older, the association between pretend play and their language development gets stronger.

As children grow older, there is an increasing proportion of pretend play (Lillard et al., 2010), rising to approximately 30 percent of children's play by age six (Christie, 1991). Children's play themes also become more creative and children engage in more elaborated play with age. Since both pretend play and language use symbolic features to convey meanings (Pellegrini & Galda, 1991), the link between language and pretend play is interpreted with the concept of abstraction and symbol. The competence of abstraction or representation gained through pretend play is likely to increase with age and gradually generalizes to language,

facilitating language development (Pellegrini & Galda, 1991). In fact, as children grow up, they are able to have ideational play transformations with abstraction (Bergen, 2002; Pellegrini & Galda, 1991), which provides them with more opportunities to explore in pretend play, resulting in growth in language skills.

The result of meta-regressions on gender and effect sizes revealed that gender showed significance in the association between pretend play and children's print awareness (b=-6.60, p= .011). Since the gender variable was coded as a continuous variable of the proportion of male participants, this significant result indicates that the effect size is stronger among girls than boys. This result is consistent with Fleer's suggestion (2010) that since play is a form of cultural expression, it needs to be considered within individual values of play rather than as a universal construct. As discussed in Chapter 2, gender, as a cultural factor, may provide children with varying experiences, such as the use of language and the themes of pretend play. For example, girls often engage in domestic theme pretend play while boys engage in more physical or rough-and-tumble play (e.g. superhero play) (Smith, 2007). These factors may have resulted in the finding of a stronger association between pretend play and print development among girls.

Differences in Various Contexts

As illustrated in Chapter 1, pretend play occurs in various contexts or settings, including activities with varying degrees of participation and structures (Nicolopoulou & Ilgaz, 2013). For example, it can take place in solitary, dyadic or collaborative forms and either with peers or under adults' assistance. Also, pretend play is a multidimensional type of play that incorporates children's toys, props, and experiences while combining language, inter-subjectivity and interaction with other players (Nwokah & Graves, 2009).

This meta-analysis has examined if the effect sizes are influenced by the contexts of pretend play (e.g., school settings, experimental classroom settings). The associations between pretend play and language development did not show differences among early childhood educational settings (e.g., preschool, nursery school, child care center). This result indicates that the link between pretend play and language development applies among children regardless of their educational settings, suggesting the link between pretend play and language development is a generalizable concept among young children.

Even though the overall effect size did not show differences according to the experimental classroom settings (e.g., natural vs laboratory) or settings of pretend play (e.g., environment- vs instruction-based), there were two results within the analyses of specific aspects of language that showed trends toward significance. First, among language structure subgroup, it was found that the effect size tended to be stronger (p=.097) in environment-based settings (r=.61) than in instruction-based settings (r=.27). Next, among print awareness subgroup, it was found that the effect size tended to be stronger (p=.079) in natural classroom settings for play (r=.64) than in laboratory settings (r=.31).

These results are likely to indicate that, despite the recent educational trends of increased academic demands (Brown, 2010; Weisberg et al., 2013; Wood, 2014), the more essential factor for helping children's language development would be a natural and free play context rather than forcing instructional attempts into children's play. In addition, it is likely that it is important to provide a natural classroom environment where children would feel safe and comfortable to explore their learning (Copple & Bredekamp, 2009).

Value of Inter-Subjectivity

The results from the moderator analyses of children's play types with peers showed a trend towards significance (p=.076) and a significant result (p<.001) respectively on the association between pretend play and overall language and language structure. For overall pretend play-language association, it was found that the effect size tended to be stronger in dyadic play (r=.54) compared to solitary play (r=.17) and collaborative play (r=.35). For language structure, it was revealed that the effect size was significantly stronger in dyadic play (r=.78) compared to collaborative play (r=.33).

With Vygotsky's theory of ZPD (1978), it was expected that the effect sizes of the association between pretend play and children's language skills would show more strengths when moderated by the active role of adults. However, the analysis of role of adults showed that the overall association between pretend play and children's language tended to be stronger (p=.083) when adults maintained passive (r=.45) than active (r=.28) roles. Similarly, the analysis of role of adults in the association between pretend play and language structure development showed a trend towards significance (p=.097) with passive adults' roles showing stronger *(*r=.61) impact than active roles (r=.26).

Results from the two analyses above may both be able to be interpreted with the concept of inter-subjectivity, which is an act of constructing a shared world between individuals through the process of negotiating meaning (Kozulin, 1990; Wink & Putney, 2002). As discussed in Chapter 2, the Vygotskian perspective (1978) theorizes that the acquisition of language emerges in the socially shared world of mutual interests, in which cooperative dialogues are essential. As Henricks (2014) pointed out, pretend play is a dialogue between differently situated individuals who both cooperate and challenge one another. Children must have an understanding in play

dialogue about what is appropriate and acceptable to the partner (Berk & Winsler, 1995; Göncü, 1993; Rommetveit, 1985). Göncü (1993) argued that with the partners' continuous responses to and expressions of new understandings in dialogue, children develop their clarification and sharing of understanding in the play scenario.

In a dyadic play, children engage in mutually shared play interactions with their partner through negotiating their ideas. This is same as Vygotsky's illustration (1978) that inter-subjectivity begins with a dialogue, and children achieve inter-subjectivity via the negotiation of personal understandings. For example, during pretend play, children negotiate turns of the plot, roles, or object entities, which engenders social and cognitive skills by letting them to negotiate their perspectives with other players (Lillard et al., 2010). Therefore, it is possible that the association between pretend play and language is stronger in dyadic play than other types of play because it is more likely to contain inter-subjectivity between individuals.

This interpretation of importance of inter-subjectivity is consistent with the findings of previous research of Rommetveit (1985). Rommetveit (1985) suggested a symmetric and an asymmetric pattern of dyadic communication and interaction. The interaction between an adult and a child at the stage of language acquisition is considered as an asymmetrical interaction due to the adult's superiority in competence. It is often represented as an interaction of "goal-directed" adult control of discourse. In contrast, symmetric dyadic interactions have reciprocal interactions between individuals, and is the acknowledgement of shared world and understanding. Rommetveit (1985) argued that this symmetric dyadic interaction was an important feature of dyadic communication and dialogue with peers.

Therefore, findings of moderator influences of adults and peer play types suggest that "pure inter-subjectivity", a word used by Rommetveit (1985) to represent the unlimited

interchangeability of dialogues within the complete symmetric dyadic interactions, may be a valuable and essential factor in the association between pretend play and language development.

Trends in Effect Size Publication

The meta-regression of publication year on the effect sizes between pretend play and overall language skills showed a result of b= -.009 (p= .069), suggesting a non-significant impact of publication year on the effect sizes. However, with p value of .069, it showed a trend towards significance. In addition, even though it showed a small coefficient (b=-.009), considering that the mean overall effect size was r=.36, it could be interpreted as a relatively considerable coefficient. Similarly and more considerably, the result of a meta-regression between publication date and effect sizes of pretend play and language structure development showed a significant coefficient (b= -.027, p=0.003). This result suggested that publication date was significantly and negatively linked to the magnitude of association between pretend play and language structure development.

These results may be interpreted as the changes of trends in reporting of the effect sizes in research. The trend of publication or report of effect sizes in research may have focused more on diverse ranges of effect sizes over time. The traditional academic field tended not to report the small magnitude of a correlative relationship or unproven hypothesis, and to report only statistically significant results with large effect sizes (Franco, Malhotra, & Simonovits, 2014). Additionally, scholarly journals also have reinforced this problem by publishing studies with significant evidence, while ignoring the studies with a lack of relationship (Polanin, Tanner-Smith, & Hennessy, 2016). Therefore, the file drawer problem has been a threat to the research field (Dalton, Aguinis, Dalton, Bosco, & Pierce, 2012; Franco et al., 2014; Polanin et al., 2016).

To counter the file drawer problem or publication bias, there have been some attempts within the research field. A recent editorial published by Elsevier (Goodchild van Hilten, 2015) has illustrated some of these attempts. For instance, the World Health Organization (WHO) announced on publishing the results of clinical trials including previously unreported results and negative findings. It is likely that these kinds of attempts to diminish the file drawer problem have led to the evolution of publication of effect sizes in the early childhood education research. In fact, Monsarrat and Vergnes (2017), in a meta-research of effect sizes, found the evolution of effect sizes in biomedical research over time, with a remarkable decrease of effect size values in biomedical research between 1990 and 2015.

In the current meta-analysis, there were no differences between published versus unpublished studies on the effect sizes in overall language development, expressive skills and language structure abilities. However, there was a significant finding (p=.008) of a stronger effect size in published studies (r=.663) compared to unpublished work (r=.177) within the subgroup of language structure. For further exploration, coding sheet and studies were reviewed, finding that Study 18 (Pellegrini, 1985), a published book chapter, reported only significant correlations between play and literate behavior in the result table. The author reported the results in a table named "Significant Inter-Correlations between Measure of Play and Literate Behavior", where only statistically significant results were reported, yielding only those effect sizes coded in the current meta-analysis. Thus, it is possible that this factor contributed to the differences on the effect sizes.

Therefore, the exclusion of less significant or smaller effect sizes may yield a biased overall average effect size estimate, and researchers would need to continue reporting null

findings (Polanin et al., 2016). Future meta-analyses will also need to include under-reported or unpublished studies to diminish the potential bias from publication status.

Limitations

Several limitations of this meta-analysis should be considered. First, even though the databases, journals, and conference proceedings for computerized search and hand search are considered to be some of the most selective in the fields, these could still have been limited databases in searching the studies extensively. Also, around 50 studies were excluded only due to the lack of sufficient information on reported statistics, but there were no attempts made to contact the authors of the studies that needed more information for effect sizes for the current meta-analysis. A larger sample size would have provided more precision in not only overall effect size but also for the analyses of language subgroups.

Second, it was not possible to train the second coder for the calculation and coding of effect sizes due to the practical reasons (e.g. time constraints) and check the interrater agreement rate on effect sizes. Even though the intra-coder consistency was checked for the reliability of effect size coding and all attempts were made to make sure to avoid the risk of single coder bias and errors, it would have been more reliable in avoiding the dependency of coding if there had been longer time period between the first and second coding.

Third, even though the grouping of three specific aspects of language development was effective for creating data analysis subgroups with enough studies, the way they were combined was imperfect. The decision making strategies for these groups were based on available variables in the studies and an overall understanding of language components. Results might be different with more precise variable groups determined a priori.

Finally, even though the current meta-analysis did not show the indication of publication bias in overall effect sizes, some of the primary studies included in the current meta-analysis only reported significant results in the original studies themselves (e.g., Pellegrini (1985)). Due to time constraints, there was no attempt to ask for information on the unreported statistics. It would have provided more precise results of effect sizes through obtaining and including those non-significant results.

Conclusion

In conclusion, with an integrative and analytic review using effect sizes from previous empirical studies, this meta-analysis presents data that demonstrate a significant and moderate association between pretend play and language development among young children. Referencing back to the suggestion of a potential meta-analysis in the previous review by Roskos et al. (2010), the current meta-analysis is consistent with their findings that the effect sizes of the associations between pretend play and language development across studies showed modest to large magnitude. In addition, consistent with their findings on inconsistence across studies, the current meta-analysis has found and explored the heterogeneity among different studies. The results are also consistent with previous research that has illustrated the importance of pretend play in children's language development (Morrow & Rand, 1991; Neuman & Roskos, 1990; Nicolopoulou & Ilgaz, 2013; Roskos & Christie, 2011; Saracho & Spodek, 2006; Weisberg et al., 2013; Whitebread & O'Sullivan, 2012). Therefore, the current meta-analysis provides evidence and further understanding of the significance of play-language relationship in early childhood education field, helping advocate for the value of play as a critical learning context in preschool despite the recent educational trends that decrease the proportion of play classroom settings (Brown, 2010; Weisberg et al., 2013; Wood, 2014).

Implications and Future Directions

Findings from moderator analyses of study characteristics suggest several moderating impacts of study characteristics on the association between pretend play and language development, addressing some implications and directions for future research. The teacher-centered pedagogy, which have been viewed as an "orientation towards coverage and elicitation of facts rather than the creation and co-construction of interconnected learning" (Myhill, 2006, p.34), will need to consider the importance of inter-subjectivity in helping children's learning within playful contexts. Considering the play-based instruction and learning through "free play", authentic involvement and interaction within children's pretend play is likely to be more essential than a one-directional instruction from teachers, even if it is a "play-based" instruction (Copple & Bredekamp, 2009; Kirkwood & Beavers, 2013).

Additionally, with the results of the current meta-analysis showing the differences of effect sizes between dyadic and other types of play, it will be important to further examine what and how the characteristics of dyadic plays would make the differences (Göncü, 1993). For instance, it will be considerable to examine whether the differences are due to the nature of dyadic play (e.g., different dynamics in dyadic play, different forms of negotiating), or some other contextual influences, such as differences of pretend play themes, relationships with peers, physical environments of play (e.g., spatial arrangement, materials, types of play areas, amount of space in the areas, whether the areas are open or partitioned) (Christie, 1991; Morrow & Rand 1991).

Future research can also focus on the role of adults, examining the influence of adults in facilitating the link between pretend ply and children's language development, and enhance our understanding of the link between theoretical frameworks and actual practices for early

childhood education. For instance, exploring the link to find out the best balance between the conceptual framework (e.g., ZPD) and practices (e.g., free-play time) will help early childhood education field to support the best practice for maximizing children's learning within their play under adults' guidance.

Finally, findings from the current meta-analysis suggest that future research will need to continue reporting null findings (Polanin et al., 2016) for further contribution to the fields of research. Future meta-analyses would do well to include larger number of studies, including the under-reported or unpublished studies, to enhance the precision of findings from meta-analyses of effect sizes.

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Figure 1 Forest Plot

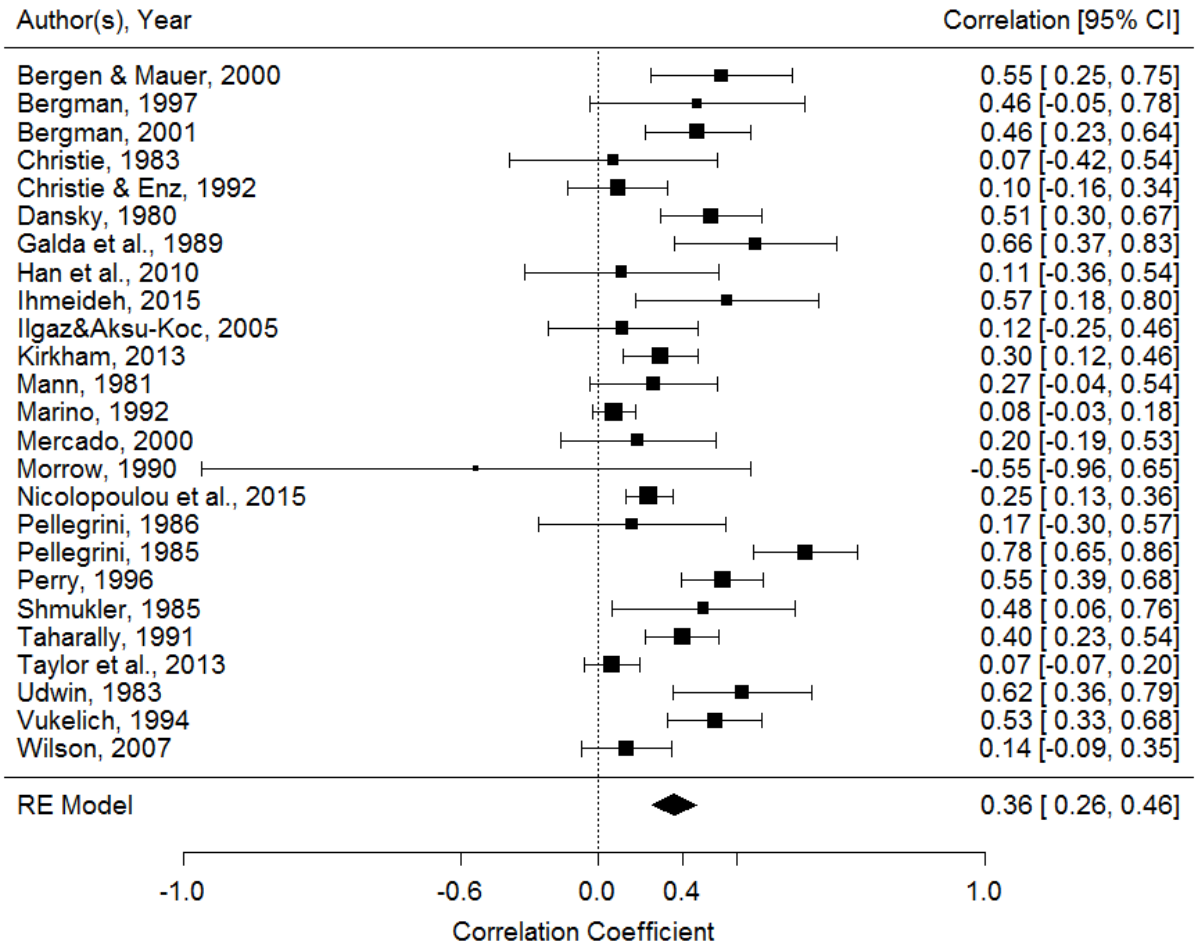

Figure 2 Baujat Plot

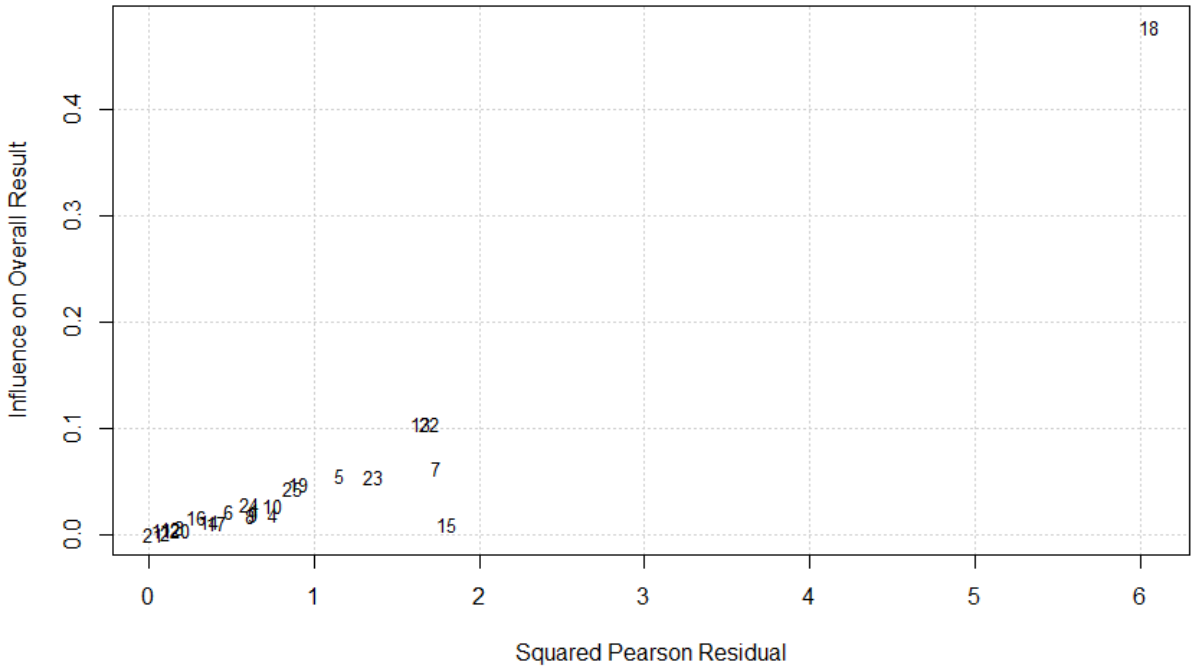

Figure 3 Influence Diagnostics Plot

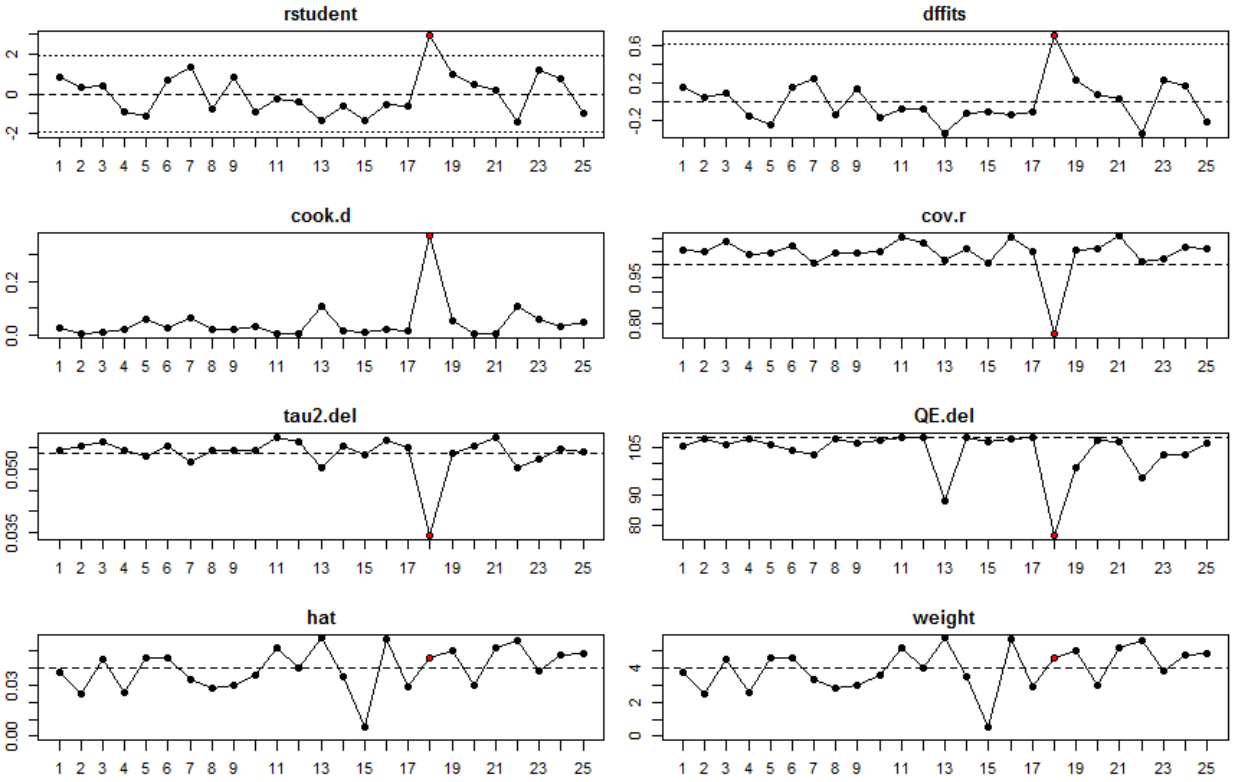

Figure 4 Forest plot (excluding outlier study)

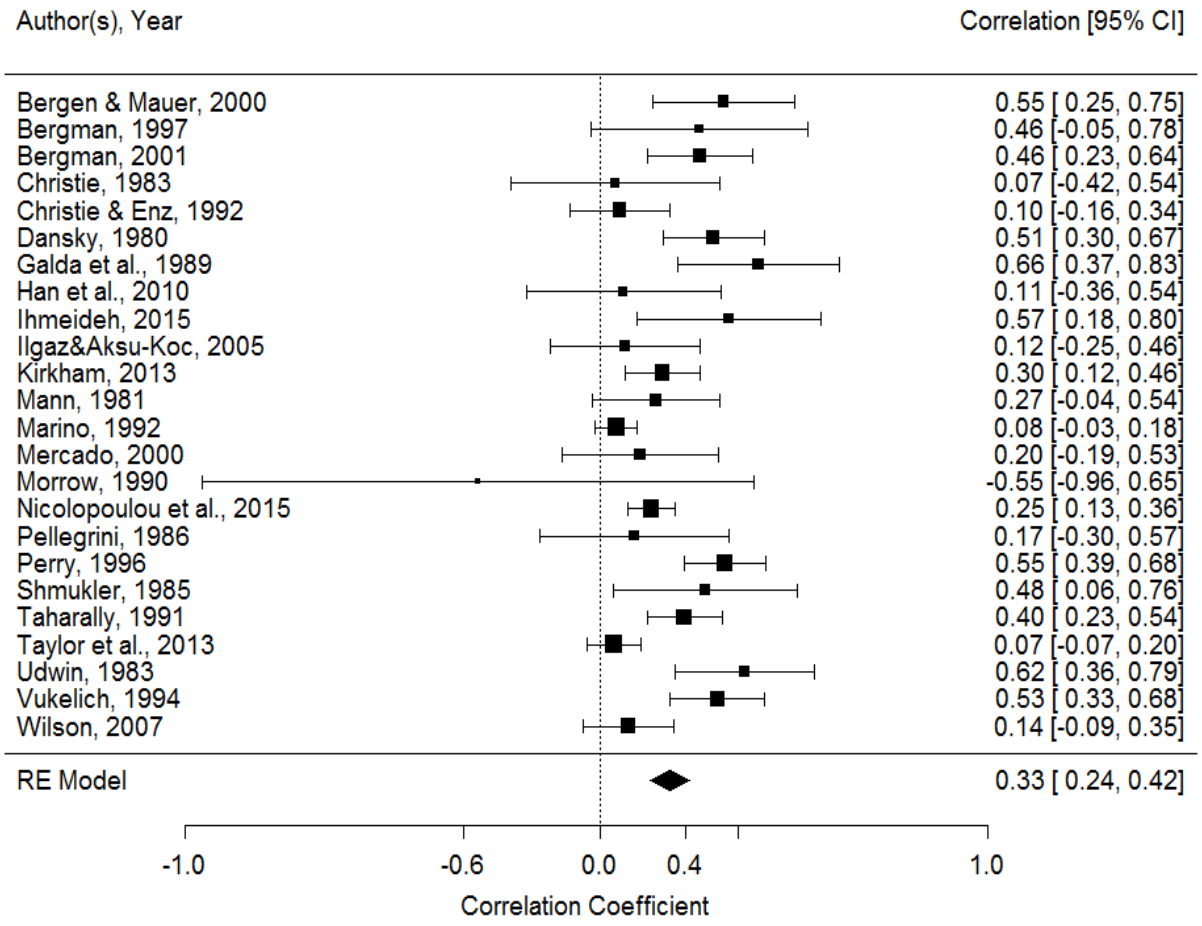

Figure 5 Funnel Plot

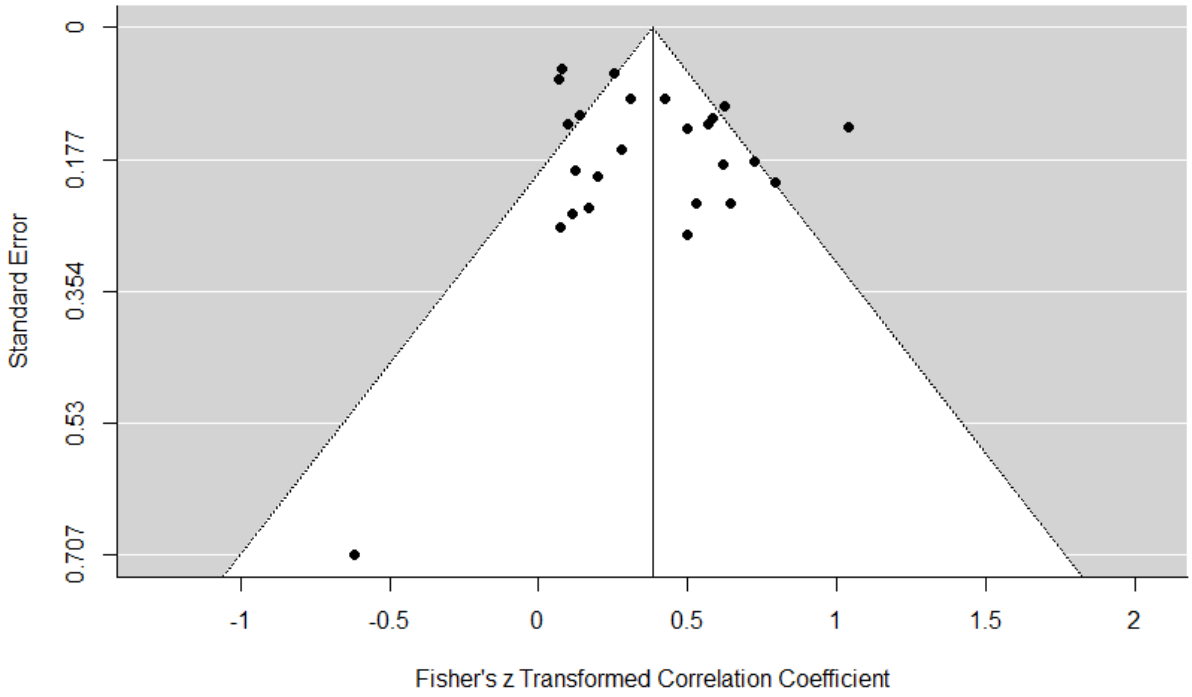

Figure 6 Trim and Fill Plot

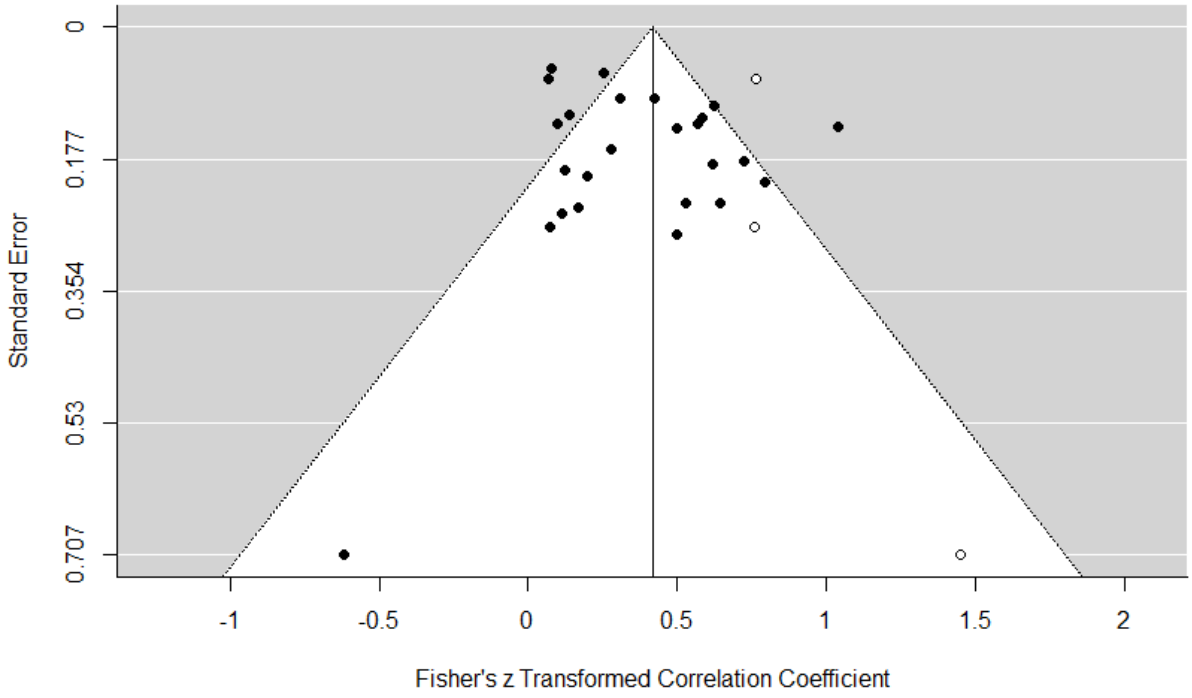

Table 1 Study Characteristics

Study	Publication Status	N	Age	Language Outcome	*r*
Bergen & Mauer (2000)	book chapter	14	55.6	word	0.55
				syllable	0.56
				rhyme production	0.54
Bergman (1997)	thesis	16	51.13	narrative	0.46
Bergman (2001)	dissertation	58	52.86	narrative	0.46
		28	42	narrative	0.44
		30	63	narrative	0.51
Christie (1983)	journal article	17	59.5	verbal intelligence	0.07
Christie & Enz (1992)	journal article	24	43.13	concepts of print	0.22
				emergent writing	0.12
				letter recognition	-0.06
Dansky (1980)	journal article	24	60.48	comprehension/sequential memory	0.57
				storytelling	0.36
				story recall	0.59
Galda et al. (1989)	journal article	26	55	writing	0.66
Han et al. (2010)	journal article	49	59.5	receptive vocabulary	-0.12
				expressive vocabulary	0.33
Ihmeideh (2015)	journal article	21	59.5	early writing development	0.57
Ilgaz & Aksu-Koc (2005)	journal article	30	55	narratives	0.12
		10	44	narratives	-0.06
		10	55	narratives	0.40
		10	66	narratives	0.02
Kirkham (2013)	journal article	60	42	expressive communication and auditory comprehension	0.25
				expressive language	0.35
		31	54	expressive communication and auditory comprehension	-0.08
				expressive language	0.13
Mann (1981)	thesis	40	55.5	simple recall	0.27
Marino (1992)	dissertation	69	53.5	receptive vocabulary	0.11
				expressive vocabulary	0.00
				receptive vocabulary	0.07
				vocabulary	0.07
				pragmatic ability	0.13
Mercado (2000)	dissertation	10	45.3	noun phrases	0.01
				verb phrases	0.17
				questions/negations	0.29
				sentence structures	0.30
Morrow (1990)	journal article	96	53.5	writing	0.89
				reading	-0.99

Nicolopoulou et al. (2015)	journal article	130	48.76	narrative comprehension	0.17
		76	48.76	print and word awareness	0.28
				beginning sound awareness	0.35
Pellegrini (1986)	journal article	20	55.2	explicit language	0.17
Pellegrini (1985)	book chapter	20	55.2	noun phrase-modifier	0.86
				noun phrase-qualifier	0.63
				future tense verbs	0.84
				endophoric cohesion	0.72
Perry (1996)	conference paper	24	59.5	thought units expressed to self	0.42
				communication clarity	0.70
				thought units with peers	0.60
				thought units with adults	0.32
				thought units with peers and adults	0.66
Shmukler & Naveh (1985)	journal article	51	55	storytelling	0.63
				verbal intelligence	0.30
Taharally (1991)	journal article	60	53	language production	0.43
				story retell	0.24
				story retell	0.51
Taylor et al. (2013)	journal article	208	54	vocabulary	0.07
Udwin (1983)	journal article	34	56	storytelling fluency	0.62
Vukelich (1994)	journal article	38	65.55	ability to read environmental print	0.61
		39	65.08	ability to read environmental print	0.44
Wilson (2007)	dissertation	20	56	expressive	0.05
				receptive	0.13
				number of words	0.23
				number of letters	0.08
		11	56	story elements/narrative	0.24

Note: N=sample size; Age= mean age (months); *r*= correlation coefficient between pretend play and each language outcome. *For studies that did not report the mean age but only reported the range of age (e.g., preschoolers of 4- and 5-year-old), the mean of 48 months and 71 months was coded (59.5M)

Table 2 Study Characteristics and Averaged Effect Sizes for Overall Analyses

Study	Publication Status	Age	School	V	*r*
Bergen & Mauer (2000)	published	55.6	preschool	0.0333	0.55
Bergman (1997)	unpublished	51.125	child care center	0.0769	0.46
Bergman (2001)	unpublished	52.86	child care center	0.0182	0.46
Christie (1983)	published	59.5	preschool	0.0714	0.07
Christie & Enz (1992)	published	43.13	preschool	0.0167	0.10
Dansky (1980)	published	60.48	child care center	0.0167	0.51
Galda et al. (1989)	published	55	preschool	0.0435	0.66
Han et al. (2010)	published	59.5	Head Start	0.0625	0.11
Ihmeideh (2015)	published	59.5	kindergarten	0.0556	0.57
Ilgaz & Aksu-Koc (2005)	published	55	preschool	0.0370	0.12
Kirkham (2013)	published	42	nursery school	0.0090	0.30
Mann (1981)	unpublished	55.5	nursery school	0.0270	0.27
Marino (1992)	unpublished	53.5	child care center	0.0031	0.08
Mercado (2000)	unpublished	45.3	preschool	0.0400	0.20
Morrow (1990)	published	53.5	preschool	0.5000	-0.55
Nicolopoulou et al. (2015)	published	48.76	preschool	0.0037	0.25
Pellegrini (1986)	published	55.2	preschool	0.0588	0.17
Pellegrini (1985)	published	55.2	preschool	0.0179	0.78
Perry (1996)	unpublished	59.5	preschool	0.0111	0.55
Shmukler & Naveh (1985)	published	55	nursery school	0.0556	0.48
Taharally (1991)	published	53	nursery school	0.0091	0.40
Taylor et al. (2013)	published	54	local birth record	0.0049	0.07
Udwin (1983)	published	56	nursery school	0.0323	0.62
Vukelich (1994)	published	65.31	kindergarten	0.0147	0.53
Wilson (2007)	unpublished	56	preschool	0.0137	0.14

Note: V=variance of each study for weighting; *r*= correlation coefficient between pretend play and each language outcome. Age= mean age (months). *For studies that did not report the mean age but only reported the range of age (e.g. preschoolers of 4- and 5-year-old), the mean of 48 months and 71 months was coded (59.5M)

Table 3 Summary of Moderator Analyses of Overall Effect Size

Moderator	*k*	Q	Mean *r*	95% CI of *r*
School				
Preschool	12		.342***	(0.18, 0.49)
Kindergarten	2		.544**	(0.19, 0.77)
Child care center	4	3.49	.363**	(0.10, 0.58)
Nursery school	5		.411***	(0.18, 0.60)
Head Start	1		.112	(-0.52, 0.66)
Local birth record	1		.066	(-0.41, 0.52)
Settings				
Environment-based	13	1.49	.425***	(0.27, 0.55)
Instruction-based	12		.299***	(0.15, 0.44)
Play type				
Solitary	3		.167	(-0.10, 0.41)
Dyadic	4	5.16†	.544***	(0.33, 0.71)
Collaborative	18		.352***	(0.24, 0.45)
Design				
Both	5		.286*	(0.00, 0.53)
Control group	8	0.96	.348***	(0.16, 0.52)
Pretest-Posttest	1		.569	(-0.04, 0.87)
None	11		.380***	(0.21, 0.53)
Role of Adults				
Passive	11	3.00†	.457***	(0.31, 0.58)
Active	14		.279***	(0.13, 0.41)
Classroom				
Natural	12	0.04	.369***	(0.21, 0.51)
Laboratory	13		.350***	(0.20, 0.48)
Publication Status				
Published	18	0.42	.388***	(0.25, 0.49)
Unpublished	7		.307**	(0.11, 0.48)

Note: k = number of studies; Q=heterogeneity across groups; r = point estimate of the effect size; CI = confidence interval; † $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4 Summary of Moderator Analyses of Expressive skills

Moderator	*k*	Q	Mean *r*	95% CI of *r*
School				
Preschool	17		.135	(-0.13, 0.39)
Child care center	12		.487*	(0.12, 0.74)
Nursery school	11	2.1	.349*	(0.04, 0.60)
Head Start	2		.114	(-0.56, 0.70)
Local birth record	1		.067	(-0.76, 0.81)
Settings				
Environment-based	21	0.04	.223	(-0.08, 0.49)
Instruction-based	22		.266*	(-0.03, 0.52)
Play type				
Solitary	9		.139	(-0.34, 0.56)
Dyadic	5	0.53	.414	(-0.21, 0.80)
Collaborative	29		.246*	(-0.01, 0.48)
Design				
Both	9		-.054	(-0.46, 0.38)
Control group	14	3.27	.449**	(0.11, 0.69)
None	20		.227*	(-0.08, 0.49)
Role of Adults				
Passive	19	1.42	.374**	(0.08, 0.61)
Active	24		.134	(-0.15, 0.40)
Classroom				
Natural	23	0.29	.194	(-0.10, 0.45)
Laboratory	20		.305*	(0.00, 0.56)
Publication Status				
Published	25	0.59	.177	(-0.10, 0.43)
Unpublished	18		.335**	(0.02, 0.59)

Note: k = number of studies; Q=heterogeneity across groups; r = point estimate of the effect size; CI = confidence interval; † $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5 Summary of Moderator Analyses of Language Structure

Moderator	*k*	Q	Mean *r*	95% CI of *r*
Settings				
Environment-based	10	2.76†	.606***	(0.42, 0.74)
Instruction-based	2		.266***	(-0.17, 0.61)
Play type				
Dyadic	4	22.36***	.778***	(0.66, 0.86)
Collaborative	8		.329***	(0.17, 0.47)
Design				
Both	2	2.76†	.266	(-0.17, 0.61)
None	10		.606***	(0.42, 0.74)
Role of Adults				
Passive	10	2.76†	.606***	(0.42, 0.74)
Active	2		.266	(-0.17, 0.61)
Classroom				
Natural	4	1.89	.386	(0.06, 0.64)
Laboratory	8		.618***	(0.41, 0.76)
Publication Status				
Published	7	7.07**	.663***	(0.49, 0.79)
Unpublished	5		.177	(-0.19, 0.50)

Note: k = number of studies; Q=heterogeneity across groups; r = point estimate of the effect size; CI = confidence interval; † $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 6 Summary of Moderator Analyses of Print Awareness

Moderator	*k*	Q	Mean *r*	95% CI of *r*
School				
Preschool	13	1.67	.414**	(0.12, 0.64)
Kindergarten	4		.698**	(0.30, 0.89)
Settings				
Environment-based	7	1.73	.632***	(0.35, 0.81)
Instruction-based	10		.394*	(0.10, 0.62)
Design				
Both	2	2.72	.691*	(0.13, 0.92)
Control group	6		.260	(-0.17, 0.61)
Pretest-Posttest	8		.578**	(0.24, 0.79)
None	1		.660	(-0.28, 0.95)
Role of Adults				
Passive	6	0.08	.538**	(0.12, 0.79)
Active	11		.476**	(0.17, 0.70)
Classroom				
Natural	8	3.09†	.642***	(0.40, 0.80)
Laboratory	9		.310*	(-0.03, 0.58)
Publication Status				
Published	16	0.73	.520***	(0.29, 0.69)
Unpublished	1		.082	(-0.77, 0.83)

Note: k = number of studies; Q=heterogeneity across groups; r = point estimate of the effect size; CI = confidence interval; † $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$.

Appendix A - Flowchart